

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: Norio KURITA et al.

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For SHUTTER UNIT AND LASER PROCESSING DEVICE USING SAME

DECLARATION AND VERIFIED TRANSLATION

Hon. Commissioner of Patents
and Trademarks
Washington, D. C. 20231

Sir:


I, Ken-ichi SHIBAYAMA, Japanese Patent Attorney registration No. 14044 with a business office at Ginza First Bldg., 10-6, Ginza 1-chome, Chuo-ku, Tokyo 104-0061 Japan, hereby declare and state that:

I am thoroughly conversant with both the Japanese and English languages; and that the attached document represents a true and accurate English translation of allowable/patentable claims in Japanese Patent Application (JP2003-374769) filed to the Japanese Patent office on November 4, 2003.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Signed this 29th day of June, 2009

Signature:



Name:

Ken-ichi SHIBAYAMA

[Document Name] Claims**[Claim 1]**

A shutter unit for selectively opening and closing the optical path of a laser beam, comprising:

a rotating member which rotates around the axis line that is substantially orthogonal to the optical axis of said laser beam, and which is provided with an opening for passing said laser beam therethrough and a reflective surface for reflecting said laser beam;

an optical absorption member for absorbing the laser beam reflected with said reflective surface; and

a drive motor having a rotational shaft disposed on said axis line;

wherein said rotating member has a base portion which rotates around said axis line, and an inclined plate extending from said base portion to said optical axis side and inclined toward said axis line side, and said rotating member is mounted on said rotational shaft;

wherein said opening is formed between said base portion and said inclined plate, and said reflective surface is formed on the outer surface of said inclined plate in relation to said axis line, and reflects said laser beam in a direction substantially parallel to said axis line;

wherein said optical absorption member is disposed on the optical axis of the laser beam reflected with said reflective surface;

wherein said drive motor is disposed outside the housing wherein said rotating member and said optical absorption member are contained, and said disposed optical absorption member is disposed on the inner wall of said housing opposite from said driving motor on the other side of said optical axis; and

wherein said laser beam entering said housing enters said optical absorption member when said reflective surface closes said optical path by the driving of said drive motor, and passes through said opening when said reflective surface does not close but opens said optical path by the driving of said drive motor.

[Claim 2]

A shutter unit according to claim 1, further comprising a first photo interrupter; and a second photo interrupter within said housing;

wherein said rotating member is provided with a light blocking plate for blocking the optical path of said first photo interrupter when said opening is positioned on said optical axis, and blocking the optical path of said second photo interrupter when said reflective surface is positioned on said optical axis; and

wherein said light blocking plate is disposed on said base portion facing said inclined plate across said axis line, and said opening is formed between said light blocking plate and said inclined plate.

[Claim 3]

A laser processing device comprising a shutter unit according to claim 1 or 2;

wherein said shutter unit is fixed to a cooling jacket mounted on a laser oscillator in order to cool said laser oscillator which outputs said laser beams.

【書類名】 特許請求の範囲**【請求項 1】**

レーザ光の光路の開放及び閉鎖を選択的に行うシャッタユニットであって、
前記レーザ光の光軸と略直交する軸線を中心として回転し、前記レーザ光を通過させる開口部、及び前記レーザ光を反射する反射面が形成された回転部材と、
前記反射面により反射されたレーザ光を吸収する光吸収部材と、
前記軸線上に配置された回転軸を有する駆動モータと、
を備え、
前記回転部材は、前記軸線を中心として回転する基部と、前記基部から前記光軸側に延在し且つ前記軸線側に傾斜した傾斜板とを有すると共に前記回転軸に取り付けられ、
前記開口部は、前記基部と前記傾斜板との間に形成され、前記反射面は、前記軸線に対し前記傾斜板の外側の表面に形成され前記軸線と略平行な方向に前記レーザ光を反射し、
前記光吸収部材は、前記反射面により反射されたレーザ光の光軸上に配置され、
前記駆動モータは、前記回転部材及び前記光吸収部材を収容する筐体の外部に配置されると共に、前記光吸収部材は前記光軸を挟んで前記駆動モータとは反対側の前記筐体内壁に配置されており、
前記筐体に入射する前記レーザ光は、前記駆動モータの駆動により前記反射面が前記光路を閉鎖する場合に前記光吸収部材に入射し、前記駆動モータの駆動により前記反射面が前記光路を閉鎖せずに開放する場合に前記開口部を通過する、ことを特徴とするシャッタユニット。

【請求項 2】

第 1 のフォトインタラプタと、第 2 のフォトインタラプタとを前記筐体内に備え、
前記回転部材には、前記開口部が前記光軸上に位置する際に前記第 1 のフォトインタラプタの光路を遮断し、前記反射面が前記光軸上に位置する際に前記第 2 のフォトインタラプタの光路を遮断する遮光板が取り付けられており、
当該遮光板は前記軸線を挟んで前記傾斜板と対向するように前記基部に配置され、前記傾斜板との間に前記開口部を形成していることを特徴とする請求項 1 に記載のシャッタユニット。

【請求項 3】

請求項 1 又は 2 に記載のシャッタユニットを備えたレーザ加工装置であって、
前記シャッタユニットは、前記レーザ光を出射するレーザ共振器を冷却するために当該レーザ共振器に取り付けられている冷却ジャケットに固定されていることを特徴とするレーザ加工装置。